No. 200400232

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

U.S. Government, as represented by the Secretary of Agriculture

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) MAY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEATGRASS, INTERMEDIATE

'Beefmaker'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-ninth day of September, in the year two thousand and six.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions* — Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER
U.S. Government, as represented by the Secretary of Agriculture

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME

3. VARIETY NAME
Beefmaker

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
USDA-ARS
Wheat, Sorgum, and Forage Research Unit
344 Keim Hall, East Campus, University of Nebraska,P.O. Box 830937
Lincoln, NE 68583-0937

5. TELEPHONE *(include area code)*
(402) 472-1564

6. FAX *(include area code)*
(402) 472-4020

FOR OFFICIAL USE ONLY
PVPO NUMBER
200400232
FILING DATE
May 14, 2004

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
U. S. Government

8. IF INCORPORATED, GIVE STATE OF INCORPORATION
NA

9. DATE OF INCORPORATION

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*

Kenneth Vogel
(Technical Representative of ARS)
344 Keim Hall, East Campus
University of Nebraska
P.O. Box 830937
Lincoln, NE 68583-0937

Richard J. Brenner
Dep. Assist. Admin. Office of Technology Transfer
5601 Sunnyside Avenue, Room 4-1159
Beltsville, MD 20705-5131

FEES RECEIVED
FILING AND EXAMINATION FEES:
$ 3652.00
DATE 5/14/2004
CERTIFICATION FEE:
$ 768
DATE 9/19/2006

11. TELEPHONE *(Include area code)*
(402) 472-1564

12. FAX *(Include area code)*
(402) 472-4020

13. E-MAIL
kpv@unlserve.unl.edu

14. CROP KIND *(Common Name)*
Intermediate Wheatgrass

16. FAMILY NAME *(Botanical)*
Poaceae

15. GENUS AND SPECIES NAME OF CROP
Elytriga intermedia

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☑ NO

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? *(OPTIONAL)*
☐ YES ☑ NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERICALIZATION. _____

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED
(Follow Instructions on reverse)

a. ☑ Exhibit A. Origin and Breeding History of the Variety
b. ☑ Exhibit B. Statement of Distinctness
c. ☑ Exhibit C. Objective Description of Variety
d. ☐ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☑ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☐ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
g. ☑ Filing and Examination Fee ($3,652), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☑ YES *(If "yes", answer items 21 and 22 below)* ☐ NO *(If "no", go to item 23)*

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?
☑ YES ☐ NO
IF YES, WHICH CLASSES? ☑ FOUNDATION ☐ REGISTERED ☑ CERTIFIED

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☑ YES ☐ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
1 FOUNDATION ☐ REGISTERED 1 CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☐ YES ☑ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☐ YES ☑ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER		SIGNATURE OF OWNER	
For			
NAME *(Please print or type)*		NAME *(Please print or type)*	
Richard J Brenner			
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
Deputy Assistant Admin.	March 8, 2004		

(See reverse for instructions and information collection burden statement)

200400232

INSTRUCTIONS

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to **reproduce** the variety, or for tuber reproduced varieties verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for $3,652 ($432 filing fee and $3,220 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice.)* Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of $432 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office
Telephone: (301) 504-5518
FAX: (301) 504-5291
Homepage: http://www.ams.usda.gov/science/pvpo/pvp.htm

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that name has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, 10301 Baltimore Avenue, Suite 401 NAL Building, Beltsville, MD 20705. Telephone: (301) 504-5682 http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

20. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

23. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

24. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

22. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

Breeder seed will be jointly maintained and produced as needed by USDA-ARS and the University of Nebraska-Lincoln with random mated isolations based on the Syn 2 Breeder Seed. Foundation and Certified Seed are limited to one generation each.

23. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

Breeder seed transfered to the University of Nebraska Foundation Seed Division for the production of Foundation Seed.

24. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

ST-470 (04-03) designed by the Plant Variety Protection Office using Word 2002.

ST-470: Exhibits for Beefmaker Intermediate Wheatgrass

Exhibit A: Breeding History of the Variety.

Beefmaker intermediate wheatgrass was developed from six plant introductions (PI 345586, PI 273733, PI 273732, PI 315353, PI 315067, and PI 3155355) (USDA-ARS, 2006) that were identified as having superior agronomic performance in the Central Great Plains in a germplasm evaluation. Approximately 40 plants from each PI strain were subdivided into ramets and the ramets for individual PI strains were transplanted into separate, isolated polycross nurseries blocks in 1978 at the University of Nebraska's Agricultural Research and Development Center near Mead, NE where all subsequent selection and polycross research was conducted. Seed was harvested in bulk in 1979 from each of the polycross nurseries. This seed was used to establish space-transplanted selection nurseries in 1980 for each strain using greenhouse grown seedlings. Each selection nursery contained approximately 1000 plants. In 1981, approximately 100 plants were visually selected for forage yield, leafiness, erectness, and absence of diseases by using a modified form or Restricted Recurrent Phenotypic Selection (RRPS). The visually selected plants were harvested for forage yield and sampled for *in vitro* dry matter digestibility (IVDMD) analysis. A selection index that equally weighted forage yield and IVDMD was used to select 20 plants from each population. A total of 120 plants were selected from the six 1000-plant selection nurseries. Two ramets, or clonal pieces, of each of the 120 plants were transplanted into an isolated polycross nursery in 1983. Seed was harvested from individual plants in 1984 and an equal amount of seed from each genotype was bulked to form experimental strain NE TI 1. The Syn 1 seed harvested in 1984 was used to establish a seeded nursery in 1985 for the production of Syn 2 seed which was used to initiate the first cycle of selection for the synthesized population. A space-transplanted selection nursery containing 1100 plants was established in 1987 using greenhouse grown seedlings started with Syn 2 seed. A modified form of RRPS was used on this selection nursery. Three hundred plants were visually selected for harvest in 1988. These plants were harvested on an individual plant basis after the plants had headed and were analyzed for IVDMD. A selection index was again used to identify plants with both superior yield and IVDMD. Sixty five plants were selected for polycrossing and were subdivided into two ramets each and transplanted into an isolated polycross nursery in 1991. Seed harvested from this nursery is NE TI 1 C1 = 'Beefmaker' and was used to establish regional tests. Seed from the NE TI 1 C1 Syn 1 polycross nursery also was used to plant an isolated 400 m^2 increase plot in 1999 which produced 18.6 kg of Syn 2 Breeder Seed in 2000.

Beefmaker intermediate wheatgrass does not have any variants or off-type plants.

Beefmaker's uniformity for morphological characters including head height, flag leaf height, flag leaf width, peduncle length, head length, and head width as measured by standard deviation is similar to that of other intermediate wheatgrass cultivars (See Table 5). Haymaker has been stable through each generation of seed increase.

Exhibit B. Statement of distinctness.

Background: In the Central Great Plains a 1% improvement in forage in vitro dry matter digestibility (IVDMD) of a pasture grass results in a 25 kg/ha improvement in beef cattle gains (Moore et al., 1995; Casler and Vogel, 1999). The intermediate wheatgrass cultivar Manska was released in 1992 based on its improved IVDMD which resulted in improved beef cattle gains (Berdahl, 1993, Moore et al., 1995).

Distinctness: Beefmaker (NE TI1 C1) was tested across several eco-regions in the Central Great Plains at the following sites: Mead, NE, Sidney, NE, Hays, KS, and Cheyenne, WY during the period 1994-1996 and Mead and Sidney, NE during the period 1999-2003. Beefmaker had the highest average IVDMD and protein (N x 6.25) concentration in these trials. It's stable, improved forage quality as measured by IVDMD is its primary distinguishing agronomic performance characteristic.

Beefmaker had the numerically highest forage IVDMD in trials at Mead, NE, Sidney, NE, Cheyenne, WY, and Hays, KS during the period 1994 to 1996 (Tables 1 and 2). In these trials, its forage IVDMD was significantly greater than the IVDMD of Manska (P=0.10) at Sidney, NE and Cheyenne, WY. In another set of trials at Mead, NE and Sidney, NE during the period 1999 to 2003, it also had numerically highest forage IVDMD than the other intermediate wheatgrass cultivars (Table 3 and 4). In these trials, Beefmaker had significantly higher Harvest 1 IVDMD (P=0.50) than all intermediate wheatgrass cultivars except for Manska and Reliant in the four years of harvest at Mead, NE (Tables 3 and 4). At Sidney, NE during years which included extended periods of drought, Beefmaker had higher IVDMD than all other intermediate wheatgrass cultivars in the trial including Manska but the differences were not significant due to the drought induced within-trial variation. Although Beefmaker's primary improved trait is IVDMD, its forage yield was equivalent to that of most of the cultivars in all trials with the exception of Haymaker which had consistently higher forage yields in the first set of trials (Table 1 and 2). Beefmaker had significantly greater Harvest 1 forage yields (P=0.05) than Manska at Mead, NE in the 1999-2003 trials (Table 3). Beefmaker's forage yields were numerically higher than those of Manska in all other trials except at Ft. Hays, KS.

The cultivar that is most similar to Beefmaker in agronomic attributes and recommended use is Manska. Beefmaker can be morphologically distinguished from Manska by pubescence on the seed heads. Beefmaker heads are entirely glabrous while over 70% of Manska heads have light to heavy pubescence as described in the Registration of Manska in *Crop Science* (Berdahl, 1993). At Mead, NE, Beefmaker's head and flag leaf height were significantly smaller (P=0.05) than those of Manska, Luna, Oahe, and Reliant intermediate wheatgrass.

Supportive data/statistics.

The supporting data is from six trials. These trials were replicated yield or performance tests. One set of trials (Central Plains Trials) included experiments at Mead, NE, Sidney,

NE, Hays, KS, and Cheyenne, WY which were conducted during the period 1994 to 1996. Another set of trials was conducted and Mead and Sidney, NE during the period 1999 to 2003 as part of a regional trial. The trial at Mead was used to collect morphological data in 2004.

The Central Plains Trials were planted in the spring of 1993. Plot size was 5ft x 15 ft. Each trial was a randomized complete block with four replicates. The trial contained five different species and a total of 33 different cultivars or experimental strains. The trials were planted at a seeding rate of 40 seeds/sq. ft. Experiments were harvested in 1994, 1995, and 1996 at Mead, Sidney, and Cheyenne and 1995 and 1996 at Hays, KS. Harvested area was 3 ft x 15 ft. Samples were collected for dry matter determination and forage quality analyses. Yields were determined on a dry matter basis. Forage quality analysis for in vitro dry matter digestibility (IVDMD), neutral detergent fiber (NDF), acid detergent fiber (ADF), and acid detergent lignin (ADL) were determined using the methods described by Vogel et al. (1999). Only data from the intermediate wheatgrasses are shown in attached Table 1 and 2.

A Northern Plains Area, USDA-ARS, regional trial was planted at several sites in the Northern Plains and Intermountain West of the USA in 1999. Two of these trials were located at Mead and Sidney, NE. The trials contained 15 different species and 77 different cultivars and experimental strains. Plot size was 5 ft x 15 ft. Harvested area was 3 ft. x 10 ft. The trials had four replicates in a randomized complete block design. Plots were seeded at a rate of 40 seeds per square foot. The Mead trial was harvested in 2000, 2001, 2002, and 2003 while the Sidney trial was harvested in 2001, 2002, and 2003. Only the data from the intermediate wheatgrass cultivars is reported in Tables 3 and 4. The Mead trial was used to collect morphological data on individual plants. Approximately 100 plants were measured for each cultivar. Measurements were made in all replicates. Forage quality analyses procedures were those described previously.

The data from the performance or yield trials were analyzed using statistical procedures for plot trials described by Snedecor and Cochran (1989) and Steel and Torrie (1960). Data was not pooled over locations and no corrections were needed within trials for non-normal distributions. No data was transformed. Least Significant Differences (LSD) were used to test for statistical differences among cultivars.

References cited:

Berdahl, J.D., R.E. Barker, J.F. Karn, J.M. Krupinsky, I.M. Ray, K.P. Vogel, K.J. Moore, T.J. Klopfenstein, B.E. Anderson, R.J. Haas, and D.A. Tober. 1993. Registration of 'Manska' pubescent intermediate wheatgrass. Crop Sci. 33:881.

Casler, M.D., and K.P. Vogel. 1999. Accomplishments and Impact from Breeding for Increased Forage Nutritional Value. Crop Sci. 39:12-20.

Moore, K.J., K.P. Vogel, T.J. Klopfenstein, R.A. Masters, and B.E. Anderson. 1995. Evaluation of four intermediate wheatgrass populations under grazing. Agron. J. 87:744-747.

Steel, R.G.D. and James H. Torrie. 1960. Principles and Procedures of Statistics. McGraw-Hill Book Company, New York.

Snedecor, G.W. and W.G. Cochran. 1989. Statistical Methods. 8th Ed. Iowa State University Press, Ames, IA

USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network -(GRIN) [Online Database]. 2006. National Germplasm Resources Laboratory, Beltsville, MD. Available at http//www.ars-grin.gov/npgs/. (Verified 28 July, 2006).

Vogel, K.P., J.F. Pedersen, S.D. Masterson, and J.J. Toy. 1999. Evaluation of a filter bag system for NDF, ADF, and IVDMD Forage analysis. Crop Sci. 39:276-279.

Exhibit C. Objective Description of the Variety.

Beefmaker has an erect growth habit and has rhizomes typical of intermediate wheatgrass. Its culms and leaves are glabrous and non-glacuous and leaf margins are smooth. Leaves are green-yellow or Munsell 5GY 5/4 (Munsell Color, 1977). Sheaths have ligules, very small auricles, and sheath margins are smooth. Spikes are oblong, erect, and have green, lanceolate glumes. Spike density is lax. Anthers are yellow. At 41° N Lat. in the Central Great Plains, it is at anthesis the last week of June. In swards at Ithaca, NE, spike and flag leaf height of individual plants were about 5 and 3 cm, respectively, shorter in height than the intermediate wheatgrass cv. Luna, Manska, Reliant, and Oahe. Its uniformity for morphological characteristics is similar to that of other intermediate wheatgrasses. Beefmaker has greater forage quality as measured by in vitro dry matter digestibility (IVDMD) when grown over a broad array of environments in the Central Great Plains than other intermediate wheatgrass cultivars and with the exception of the cultivar Haymaker, has equivalent forage yields. Beefmaker is adapted to USDA Plant Hardiness Zones 3, 4, and 5.

Table 1. Means for forage yield and forage quality traits of intermediate wheatgrasses evaluated at Mead and Sidney, NE, Cheyenne, WY, and Hays, KS in 1994-1996.

Entry	Forage Yield[1]				IVDMD[2]				Crude Protein[3]			
	Mead	Sidney	Cheyenne	Ft. Hays	Mead	Sidney	Cheyenne	Ft. Hays	Mead	Sidney	Cheyenne	Ft. Hays
	Mg/ha				%				%			
Beefmaker (NE TI1 C1)	7.87	4.20	2.07	5.88	61.0	63.2	66.5	60.6	10.0	9.8	8.5	9.5
Haymaker (NE TI3)	8.56	4.29	2.33	6.65	60.1	62.1	63.8	59.8	10.0	9.1	7.8	9.7
Slate	7.88	4.71	2.48	6.11	61.0	60.5	63.0	59.3	10.5	8.1	7.3	8.5
Manska	7.32	4.06	2.06	5.92	61.0	61.1	64.9	60.4	9.9	8.5	7.8	9.1
Reliant	8.04	4.43	2.33	5.75	61.8	61.4	64.6	60.4	10.2	9.3	7.9	9.3
LSD 0.10	0.86	0.51	0.50	0.82	1.6	1.9	1.4	1.2	0.7	-	0.5	0.8

[1] Forage yields harvested after heading. Means over years for 1994, 1995, and 1996 for Mead, Sidney, and Cheyenne, and for 1995 and 1996 for Hays, KS. Plots at Mead fertilized with 112 kg/ha N/year. Other sites feritlized at 45 kg/ha N. To convert to tons/ acre multiply by 0.446

[2] IVDMD = in vitro dry matter digestiblity for samples collected at the time of harvested.

[3] Crude protein = N concentration x 6.25. Means over years of samples collected at time of harvest.

Table 2. Means for forage yield and forage quality traits of intermediate wheatgrasses evaluated at at Mead and Sidney, NE, Cheyenne, WY, and Ft. Hays, KS in 1994 through 1995 over locations.

Entry	Forage yield [1]	IVDMD [2]	C.Protein [3]
	Mg/ha	%	%
Beefmaker (NE TI1 C1)	5.01	62.8	9.4
Haymaker (NE TI3)	5.46	61.4	9.1
Slate	5.30	60.9	8.6
Manska	4.84	61.8	8.8
Reliant	5.14	62.1	9.2
LSD 0.10	0.85	3.3	0.5

Note: footnotes are the same as for Table 1.

Table 3. Forage yield and quality traits for cultivars in the Northern Plains cool-season grass evaluation trial conducted at Mead, NE during the period 1999-2003

Cultivar	Species	Harvest 1 (mean for 2000, 2001, 2002, & 2003)							2004	Harvest 2 (mean for 2001 and 2002)						
	abbrev.	Yield	DM	NDF	ADF	ADL	IVDMD	N	Heading date	Yield	DM	NDF	ADF	ADL	DMD	N
		Mg/ha	%	%	%	%	%	%	DOY	Mg/ha	%	%	%	%	%	%
Greenar	IWG	9.05	40.00	68.75	38.43	5.68	64.61	1.51	160	0.92	48.00	60.97	33.38	3.33	73.76	1.41
Luna	IWG	8.63	45.00	69.63	39.95	6.18	62.89	1.36	154	1.56	43.00	59.98	32.55	3.57	76.90	1.69
Manska	IWG	8.64	40.00	68.33	37.79	5.51	66.25	1.55	171	0.98	49.00	60.70	32.88	3.73	74.61	1.48
Beefmaker	IWG	9.22	38.00	68.74	38.21	5.22	66.47	1.49	169	0.62	50.00	59.66	32.29	3.24	76.06	1.43
Oahe	IWG	9.50	41.00	69.07	38.58	5.54	64.12	1.43	163	0.84	47.00	59.94	32.50	3.40	74.78	1.48
Reliant	IWG	9.71	37.00	69.07	38.35	5.34	65.95	1.52	170	1.04	45.00	59.62	32.56	3.50	75.50	1.58
Rush	IWG	9.32	40.00	69.26	38.28	5.43	64.95	1.48	164	1.01	46.00	59.69	31.88	3.38	75.86	1.65
LSD 0.05		0.52	0.01	0.43	0.47	0.19	0.92	0.08	5	0.26	0.02	1.40	1.20	0.31	2.36	0.20

DM = dry matter (dry wt./wet wt.), NDF = neutral detergent fiber, ADL = acid detergent fiber, ADL = acid detergent lignin, IVDDM = in vitro dry matter digestibility, N = nitrogen.
Heading date measured as Day-of-year (DOY).

Table 4. Forage yield and quality traits for cultivars in the Northern Plains cool-season grass evaluation trial conducted at Sidney, NE during the period 1999-2003

Cultivar	Species	Harvest 1 (mean for 2001, 2002, & 2003)						
	abbrev.	Yield	DM	NDF	ADF	ADL	IVDMD	N
		Mg/ha	%	%	%	%	%	%
Greenar	IWG	3.26	55.00	66.30	35.74	5.60	72.11	1.79
Luna	IWG	3.19	59.00	68.27	37.90	5.89	68.96	1.53
Manska	IWG	3.45	55.00	65.99	35.86	5.56	73.02	1.69
Beefmaker	IWG	3.65	54.00	64.81	34.79	5.22	73.87	1.84
Oahe	IWG	3.77	56.00	66.88	36.67	5.45	70.18	1.48
Reliant	IWG	3.55	54.00	65.56	35.62	5.81	71.79	1.77
Rush	IWG	3.03	55.00	65.80	35.51	5.49	72.63	1.92
LSD 0.05		0.60	.	1.74	1.39	0.41		0.27

Abbreviations are the same as for Table 3.

Table 5. Morphologic traits of intermediate wheatgrass cultivars at Mead, NE in 2001.

Cultivar or stain	Head height (cm)	Flag leaf height (cm)	Flag leaf width (mm)	Peduncle length (cm)	Head length (cm)	Head width (mm)
	.....Mean (Standard deviation [1].....					
Haymaker (NE TI3)	114.1 (11.2)	81.2 (8.6)	10.0 (2.6)	6.8 (6.3)	26.2 (6.6)	6.8 (2.3)
Beefmaker (NE TI1 C1)	107.9 (11.4)	78.4 (9.2)	9.2 (2.3)	3.9 (4.5)	25.2 (6.7)	9.3 (2.4)
Luna	117.8 (11.6)	82.7 (8.7)	7.6 (2.2)	13.7 (7.8)	20.8 (.52)	6.9 (1.6)
Manska	112.6 (12.1)	81.8 (9.7)	9.4 (3.0)	3.9 (4.7)	26.3 (6.4)	8.8 (2.7)
Oahe	118.8 (10.5)	86.2 (9.4)	8.9 (2.1)	5.7 (5.1)	27.1 (4.6)	10.0 (6.7)
Reliant	113.6 (11.0)	83.9 (8.5)	9.7 (2.8)	6.1 (6.3)	22.9 (5.2)	8.1 (2.4)
LSD 0.05	4.3	3.5	1.0	2.6	2.4	1.8

[1] Mean of 60 plants grown in swards.

U.S. DEPARTMENT OF AGRICULTURE
EXHIBIT C
AGRICULTURAL MARKETING SERVICE
SCIENCE & TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MARYLAND 20705

OBJECTIVE DESCRIPTION OF VARIETY
WHEATGRASS

NAME OF APPLICANT(S)
K. P. Vogel

ADDRESS (*Street and No. or R.F.D. No., City, State, and Zip Code*)

344 Keim Hall, E.C.
University of Nebraska
P.O. Box 830937
Lincoln, NE 68583-0937

FOR OFFICIAL USE ONLY
PVPO NUMBER 200400232

VARIETY NAME
Beefmaker

TEMPORARY OR EXPERIMENTAL DESIGNATION

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. ☐☐ or ☐☐) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 25 plants. Comparative data should he determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used: _____

Please answer all questions for your variety; lack of response may delay progress of your application.

1. SPECIES:

[7] Common and Scientific Name:

1 = Fairway Crested Wheatgrass (*Agropyron cristatum*)
2 = Standard Crested Wheatgrass (*Agropyron desertorum*)
3 = Siberian Wheatgrass (*Agropyron fragile spp. sibiricum*)
4= StreambankWheatgrass (*Elymus lanceolatus ssp.lanceolatus*)
5 = Slender Wheatgrass (*Elymus trachycaulus*)
6 = Tall Wheatgrass (*Elytrigia elongata*)
7 = Intermediate Pubescent Wheatgrass (*Elytrigia intermedia ssp. intermedia*)
8= RS Wheatgrass (*Elytrigia repens repens x Pseudoroegneria spicata*)
9 = Thickspike Wheatgrass
10 =Western Wheatgrass (*Pascopyrum smithii*)
11 = Beardless Wheatgrass (*Pseudoroegneria spicata ssp. inermis*)
12 = Bluebunch Wheatgrass (*Pseudoroegneria spicata ssp. spicata*)
13 = Other = _____

[ ] Interspecific Hybrid:

1 = *Agropyron cristatum* x *desertorum* = Crested Wheatgrass
2 = *Elytrigia repens ssp. repens* x *Pseudoroegneria spicata* = RS Wheatgrass
3 = *Pseudoroegneria spicata* x *Elymus lanceolatus*

[3] Ploidy Level:

1 = 2n=2x
2 = 2n=4x
3 = 2n=6x
4 = 2n=8x

2. ADAPTATION:

Geographical Regions: Central and Northern Great Plains

Land Resource Areas: _____

[3,4,5] USDA Plant Hardiness Zones:

1 = 1, 2=2, 3=3, 4=4, 5=5, 6=6, 7=7, 8=8, 9=9, 10 = 10, 11= 11

10

3. MATURITY:

[ ] Relative Maturity: 1 = Very Early, 2 = Early, 3 = Medium Early, 4 = Medium, 5 = Medium Late, 6 = Late, 7 = Very Late

[ ][ ][ ] Days to Anthesis: At 41 degrees N Lat at anthesis the last week of June, Similar to other Int Wheatgrass

[ ][ ] Number of Days Earlier. Name of Check Variety: _____
Same Number of Days. Name of Check Variety: _____
[ ][ ] Number of Days Later. Name of Check Variety: _____

4. PLANT:

[ ][ ][ ] Plant Height in Centimeters (cm): See Attached Tables

[ ][ ] Number of cm. Shorter. Name of Check Variety: _____
Same Height. Name of Check Variety: _____
[ ][ ] Number of cm. Taller. Name of Check Variety: _____

[1] Growth Habit: 1 = Erect, 2 = Semierect, 3 = Prostrate

[1] Rhizomes: 1 = Present, 2 = Absent

[1] Culm Pubscence: 1 = Glabrous, 2 = Pubescent, 3 = Partial, 4=Variable

[2] Culm Glaucosity: 1 = Glaucous, 2 = Non-glaucous, 3 = Variable

5. LEAF:

[8] Leaf Color: 1 = Blue-green, 2 = Grey-green, 3 = Dark Green, 4 = Green, 5 = Light Green, 6 = Yellow-green, 7 = Slate-green, 8 = Other: Green-Yellow

Leaf Color Reference Number: Munsell 5GY 5/4

[1] Leaf Pubsecence: 1 = Glabrous, 2 = Pubescent, 3 = Partial, 4=Variable

[2] Leaf Glaucosity: 1 = Glaucous, 2=Non-glaucous 3=Variable

[1] Leaf Margin: 1 = Smooth, 2 = Toothed

[ ][ ][ ] Leaf Length in centimeters. See attached table

[ ][ ] Number of cm. Shorter. Name of Check Variety: _____
Same Length. Name of Check Variety _____
[ ][ ] Number of cm. Longer. Name of Check Variety: _____

[ ][ ] Leaf Width in millimeters .

[ ][ ] Number of mm. Narrower. Name of Check Variety: _____
Same Width. Name of Check Variety: _____
[ ][ ] Number of mm. Wider. Name of Check Variety: _____

[1] Sheath Auricles: 1 = Present, 2 = Absent Very Reduced

[1] Sheath Margins: 1 = Smooth, 2 = Toothed _____

[1] Sheath Ligule: 1 = Present, 2 = Absent _____

6. SPIKE: *(Please note the decimal point)*

[1] Spike Shape: 1 = Oblong 2 = Tapering 3 = Clavate 4 = Elliptical

[1] Spike Orientation: 1 = Erect 2 = Semierect 3 = Drooping

[1] Anther Color: 1 = Yellow 2 = Red 3 = White 4 = Green 5 = Purple 6 = Other = _____

[1] Glume Color: 1 = Green 2 = Grey-Green 3 = Yellow 4 = Tan 5 = Tawny 6 = Buff 7 = Other = _____

[ ][ ].[ ] Spike Length in centimeters. _____

[1] Spike Density: 1 = Lax 2 = Laxidense 3 = Dense

[2] Glume Shape: 1 = Lanceolate 2 = Obovate 3 = Ovate

7. SEED: *(Please note the decimal point)*

[6/7] Glume Length in millimeters. Glume Color: lower/upper glume; tan; awn absent

[1][0].[0] Lemma Length in millimeters. Glume Awn (*descriptors*): _____

[ ][2].[0] Lemma Width in millimeters. _____

[3] Lemma Pubescence: 1 = Pubescent 2 = Partial 3 = Glabrous

[1] Lemma Awn Size: 1 = Very Short 2 = Short 3 = Medium Short 4 = Medium 5 = Medium Long 6 = Long 7 = Very Long

[4][8][6][0] Seed Weight in milligrams per 1000 seeds.

8. DISEASE AND PEST RESISTANCE: 1=Susceptible 2=Resistant 3=Tolerant 4=Avoidance 0=Not Tested

[0] Leaf Rust: Dromyces *dactylidis* [0] Stem Rust: *Paccinia graminis ssp. graminicola* [0] Stripe Rust: *Puccinia striiformis*

[0] Other Disease(s): _____

[0] Black Grass Bug: [0] Grass Billbug: [0] Pacific Grass Bug:

[0] Other Insect(s): _____

[0] Nematode(s) *(please specify as to* species): _____

9. INTENDED USE: *Please indicate All that Apply.*

[1,2,3] 1 = Hay and Pasture 2 = Range Reseeding 3 = Conservation Cover 4 = Erosion Control 5 = Silage/Green Manure 6 = Wildlife Habitat Plantings 7. Saline/Alkaline Soil Stabilization 8. Other = _____

10. Comments:

11. Does the variety contain any genetic material introduced (into this variety or a parent) using the biotechnology techniques of cloning and genetic transformation? *(I.e.* "genetic modification")?

12

☐ Yes ☒ No

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued *(7 U.S.C. 2421)*. The information is held confidential until the certificate is issued *(7 U.S.C. 2426)*.

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
U.S. Government, as represented by the Sec. of Agriculture		Beefmaker
4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*	**5. TELEPHONE** *(Include area code)*	**6. FAX** *(Include area code)*
USDA-ARS Wheat, Sorghum, and Forage Research Unit 344 Keim Hall,East Campus, U. of Nebraska, P.O. 830937 Lincoln, NE 68583-0937	(402) 472-1564	(402) 472-4020
	7. PVPO NUMBER 200400232	

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. **If no, please explain.** ☑ **YES** ☐ **NO**

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? **If no, give name of country.** ☐ **YES** ☐ **NO**

10. Is the applicant the original owner? ☑ **YES** ☐ **NO** **If no, please answer one of the following:**

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?
☐ **YES** ☐ **NO** **If no, give name of country**

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?
☐ **YES** ☐ **NO** **If no, give name of country**

11. Additional explanation on ownership *(Trace ownership from original breeder to current owner. Use the reverse for extra space if needed)*:

Beefmaker was bred by Kenneth Vogel, an employee of the USDA-ARS. His rights have been assigned to the U.S. Government, as represented by the Secretary of Agriculture.

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.